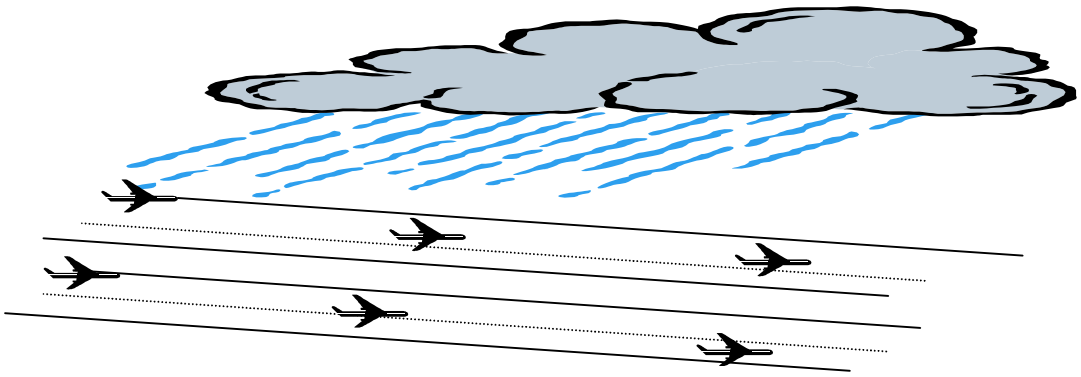
AW-1: Maintain Runway Use in Reduced Visibility

Continue arrival and departure operations as weather deteriorates from VMC to IMC by increasing instrument approach services.



Background

Aircraft arrival and departure rates generally decrease at airports as weather deteriorates from Visual Meteorological Conditions (VMC) to Instrument Meteorological Conditions (IMC). This reduced capacity is primarily due to the inability to continue operations because of a lack of instrument approach services or aircraft capability to use those services. Other capacity limiting operational restrictions, such as increased en-trail approach standards and closely spaced parallel runway operations are addressed in AW-2.

Ops Change Description

Instrument approach capability will continue to increase in the mid-term, providing access to runways in IMC beyond what is available today. Existing approach services will be sustained over the next ten years, except at a limited number of navaid facilities where usage does not support continued operation. New precision approach services will be provided to support the increasing demand for these services. Airport improvements in runways markings, airport lights, and surveillance systems will be increased to support this precision approach capability.

Instrument approach procedures will be published for most runway ends capable of supporting them. Procedures for Part 139 (scheduled air carrier) airports will be completed by 2006. Procedures for public airports with runways over 5000 feet will be completed by 2010. Capability will continually increase as Lateral Navigation/Vertical Navigation (LNAV/VNAV) approach services become universally available over the US airspace in the mid-term and will be upgraded to be capable of Category I operations in the long-term using Local Area Augmentation System (LAAS) and then Wide Area Augmentation System (WAAS). FAA is currently working on new area navigation (RNAV) based required navigation performance (RNP) approach procedures. The following RNAV procedures with vertical guidance, are scheduled to be published on July 12, 2001:

- LBO Rwy 18, CBK Rwy 35, M06 Rwy 34, GR3 Rwy 18 and Rwy 24, and JYG Rwy 15 *(runway ends with no previous Standard Instrument Approach Procedure established prior to the RNAV procedure).*
- LBO Rwy 36, M06 Rwy 16, ILM Rwy 17, BDE Rwy 12, MBS Rwy 14 and Rwy 32, and JYG Rwy 33 *(runway ends with previous non-precision approaches established prior to the RNAV procedure).*

These approach procedures will increase in both availability and usage as widespread equipage and operations are enabled by the new navigation services. Increased usage of RNAV/RNP procedures will increase capacity at airspace constrained airports.

Definition and Requirements for Instrument Approach Services

Due to the complexity of the terms used in this paper, a set of definitions that provide a foundation for the discussion of the detailed operational changes are presented below.

- *Non-precision approach (NPA)* – Non-precision approach services support approach operations between 3 miles and 1 mile of visibility. LNAV criteria define non-precision approach procedures. Current criteria for LNAV is very similar to that for Localizer approaches (part of ILS), except the source for the signal is, of course, not a localizer but rather a course developed between waypoints. Display within the cockpit varies by manufacturer of the airborne equipment, but generally can be thought of as similar to the localizer displays; i.e., with variance from course centerline displayed on the cockpit instrument as simple displacement of the indicator needle from its centerpoint.
- *Precision approach (PA)* – Below 1 mile visibility, increasing levels of precision approach operations require increasing levels of airport runway capability, airport runway lights, approach lights, runway visual range, and precision approach services.
- *Category I* – Category I operations support stabilized approach to as low as a 200' decision height, depending on obstacles and runway capability. An airport capable of supporting scheduled air carrier service (Part 139) requires appropriate runway construction, markings, and signage to support PA operations.
- *Category II* – Category II operations support stabilized approaches to as low as 100' decision height. A more accurate, higher continuity PA signal, high approach lights (ALSF-2) and rollout RVR sensor enable Category II operations.
- *Category III* – Category III operations support stabilized approach, landing, and rollout operations to as low as no decision height. A more accurate, higher continuity signal and mid-point RVR sensor enable Category III operations.

Benefits, Performance and Metrics

- Throughput in arrivals per hour are sustained at a higher level as the ceiling and visibility decrease.
- Increase in arrivals per hour as weather conditions deteriorate to IMC.

Scope and Applicability

Near-Term:

- Currently, there are 61 new LNAV runways/airports (straight in approaches available for the first time) in FY01, with a total of 1144 runways with new LNAV approaches to date. For LNAV/VNAV approaches, there are 65 new in FY01, with a total of 108 to be accomplished in FY01. These approaches are not intended as replacement for Instrument Landing System (ILS) approaches. It is only with LAAS and then WAAS deployment that the evolution to CAT I through CAT III operations becomes a reality. These approaches do provide access to runways/airports that currently do not have any precision approach capabilities (no ILS possible), and improve safety. In most cases, these LNAV/VNAV approaches actually decrease Minimum Decision Altitude (MDA) from current operations (e.g., PNS Rwy 8 and Rwy 35). The most recent new LNAV/VNAV procedures that were published on May 17, 2001 for runways that had no previous Standard Instrument Approach Procedure (SIAP) are:

  - Rantoul (2I5), Runway 9, 18, and 36
  - Atkinson Municipal (PTS), Runway 21 and 34
  - Pensacola (PNS), Runway 26
  - Lee County – Brick Field (TTA), Runway 21
  - Flora Municipal (FOA), Runway 3

- *New RNAV instrument approach procedures.* The total number of instrument approach procedures in the NAS has doubled since 1994 to about 12,600. 3,009 GPS NPA procedures have been developed and over 2,427 have been published. All new RNAV instrument approach procedures are being developed with lateral and vertical guidance, unless the approach cannot accommodate the procedure. Approaches for the 576 airports serving Part 139 operations are in development and will be completed by 2006.
- *New precision approach services.* Precision approach capability will be established, improved, or sustained at several runways with ILSs, approach lighting systems, runway visual range, and Precision Approach Path Indicator (PAPI). None of the FAA qualifiers for new ILSs will be established in the near term. Of the 15 facility mandates in 1999, 10 in 2000, and 28 in 2001, 14 of 53 will be commissioned in the near term. Critical requirements for two ALSF-2 and four MALSR replacement projects are identified as near-term critical funding needs to avoid loss of approach services in the near term. The requirements to sustain ground based navigational aids will be approved in the near term. Previously identified safety needs for PAPI and distance measuring equipment will be analyzed in the near term.
- National SOIA standards will be developed with the user community.

Mid-Term:

- A number of ILSs and associated ancillary aids will be installed at select runways to provide new precision approach capability. The remaining 39 congressional mandate locations will be satisfied.

- WAAS will provide approach services supporting LNAV/VNAV approaches NAS-wide at locations where only non-precision approaches exist today. Most of the approaches at the Part 139 airports will be completed in the mid-term, with the balance completed by 2006.
- LAAS will provide precision approach services authorized to support Category I operations.
- Beyond the initial five sites for the Precision Runway Monitor (PRM) System, up to two other sites will receive this system to support closely spaced runway operations in IMC and Simultaneous Offset Instrument Approaches (SOIA) in deteriorating VMC.
- RNAV Instrument Approach Procedures: 780 public airports with runways over 5000 feet long will be completed by 2010.
- Expect further site specific SOIA procedure development as new PRM sites are approved and will be used.

Long-Term:

- WAAS service planned for upgrade to Category I capability. A WAAS upgrade decision will be made by 2002. A decision on how far to reduce the existing ground-based infrastructure will be made in 2006. LAAS Category I approach procedures will start becoming available in 2003. Of the 160 airports planned for LAAS services, 104 airports will be upgraded in the long-term to provide services supporting Category II/III operations, and the remaining 56 will continue to support Category I procedures.
- Although approximately 1100 NAS runway ends are equipped to support PA service, many of the approximately 3000 NPA runway ends in the NAS will require airport infrastructure upgrades to support PA services. Visibility minimums of 1 mile can be supported with visual runway markings and low intensity runway lights (LIRL) for nighttime operations. Medium intensity runway lights (MIRL) and precision or non-precision runway markings are required to reduce visibility minima to 3/4 mile. To establish 1/2 mile-visibility minimums the additional equipment requirements are precision runway markings, MIRLs for nighttime operations, and an approved approach lighting system.
- The LAAS services will be extended at major airports with eligible runways to Category II/III precision starting in 2006.
- For most paved public airports, GPS precision approaches augmented by WAAS will support visibility of one mile without requiring significant airport improvements in marking, lighting, and signage, but only Part 139 and public airports with 5000’ runways will have instrument approach procedures by 2010. Procedures for the remaining 1,300 public airports with paved runways will be accommodated after 2010.

Key Decisions

- FAA and users will determine end-state services for WAAS and LAAS systems (technical feasibility and economic issues) before deployment, aircraft equipage, and ILS decommissioning begins. Key decision points are 2002 on WAAS upgrade path, and 2006 on ILS decommissioning path.
- Definition of WAAS and LAAS concepts and procedures.
- Complete Advisory Circulars 120-29A, 20-RNP and 90-RNP.
- Approval of Global Navigation Satellite System (GNSS) Standards and Recommended Practices by ICAO states.
- Approvals for PRM/SOIA procedures.
- Development and training of ATC procedures.

Key Risks

- Funding to develop, procure, install, and commission the above planned services.
- Geo-stationary satellite leases/acquisition risk for WAAS services.
- Timing and availability of WAAS/LAAS services.
- Voluntary user equipage and usage of WAAS/LAAS avionics/capability.
- Environmental and airport infrastructure constraints.
- Schedule for production version of WAAS/LAAS receiver.
- Planning for markings, signage, and lighting for precision approach runways.
- Pilot acceptance for SOIA procedures.